AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1. (cancelled)

2. (new) A method of dynamically compensating for signal loss and dispersion in an optical signal traversing though an optical network; comprising:

providing a dynamic gain equalization filter (DGEQ) having a dynamically adjustable transfer function;

providing a first optical amplifier and a second optical amplifier interconnected by the DGEQ to form a dynamic amplifier site in the optical network; and

controlling spectral power profile of the optical signal at an output of the dynamic amplifier site by dynamically adjusting a transfer function associated with the DGEQ;

controlling average power of the optical signal by dynamically adjusting gains of the first optical amplifier and the second optical amplifier; and

decoupling a first optical amplifier control loop, a DGEQ control loop, and a second optical amplifier control loop, respectively utilized to control outputs of the first optical amplifier, the DGEQ, and the second optical amplifier.

3. (new) The method in accordance with Claim 2 wherein controlling the spectral power profile comprises utilizing the DGEQ control loop to dynamically adjust the transfer function of the DGEQ, thereby controlling a DGEQ output such that the optical signal at the output of the amplifier site is flat and has a target optical power profile.

4. (new) The method in accordance with Claim 2 wherein controlling average power of the optical signal comprises utilizing the first optical amplifier control loop to control a first optical amplifier output such that the power level of an output of the DGEQ is maximized and does not exceed a maximum allowable value per channel.

5. (new) The method in accordance with Claim 2 wherein controlling average power of the optical signal comprises utilizing the second optical amplifier control loop to control the second optical amplifier, thereby dynamically adjusting the total output power of the optical signal such that the optical signal at the output of the amplifier site has an optimum signal to noise ratio.

6. (new) The method in accordance with Claim 2 wherein decoupling comprises layering time-constants of the first optical amplifier control loop, the DGEQ control loop, and the second optical amplifier control loop, such that respective frequencies of the first optical amplifier control loop, the DGEQ control loop, and the second optical amplifier control loop are not competing.

7. (new) A method of dynamically compensating for signal loss and dispersion in an optical signal traversing though an optical network; comprising:

providing a dynamic gain equalization filter (DGEQ) having a dynamically adjustable transfer function;

providing a first optical amplifier and a second optical amplifier interconnected by the DGEQ to form a dynamic amplifier site in the optical network; and

partitioning control objectives amongst the first optical amplifier, the second optical amplifier, and the DGEQ, thereby compensating for signal loss and dispersion in the optical signal.

8. (new) The method in accordance with Claim 7 wherein partitioning control objectives comprises:

controlling average power of the optical signal by dynamically adjusting a gain of the first optical amplifier and a gain of the second amplifier; and

controlling spectral power profile of the optical signal by dynamically adjusting the transfer function of the DGEQ.

9. (new) The method in accordance with Claim 8 wherein controlling average power of the optical signal comprises utilizing a first optical amplifier control loop to control the first optical amplifier, thereby maintaining the power level of an output of the first optical amplifier such that the power level of an output of the DGEQ is maximized and does not exceed a maximum allowable value per channel.

10. (new) The method in accordance with Claim 8 wherein controlling average power of the optical signal comprises utilizing a second optical amplifier control loop to control the second optical amplifier, thereby dynamically adjusting the total output power of the optical signal such that the optical signal has an optimum signal to noise ratio at an output of the amplifier site.

11. (new) The method in accordance with Claim 8 wherein controlling the spectral power profile comprises utilizing a DGEQ control loop to dynamically adjust the DGEQ transfer function, thereby controlling the DGEQ such that the optical signal at an output of the amplifier site is flat and has a target optical power profile.

12. (new) The method in accordance with claim 7 further comprising decoupling a first optical amplifier control loop, a DGEQ control loop, and a second optical amplifier control loop, respectively utilized to control outputs of the first optical amplifier, the DGEQ, and the second optical amplifier.

13. (new) The method in accordance with Claim 12 wherein decoupling comprises layering time-constants of the first optical amplifier control loop, the DGEQ control loop, and the second optical amplifier control loop such that respective frequencies of the first optical amplifier control loop, the DGEQ control loop, and the second optical amplifier control loop are not competing.

14. (new) A dynamic optical amplifier system, comprising:

a dynamic gain equalizer (DGEQ) filter configured to receive an optical signal and operable to adjust a spectral power profile of the optical signal;

at least one optical amplifier connected to said DGEQ filter and operable to adjust optical power level of the optical signal; and

an optical spectral analysis (OSA) unit configured to measure spectral power profile of the optical signal at a plurality of measurement points in said system, wherein the measurements are utilized in at least one optical amplifier control loop and a DGEQ control loop.

15. (new) The system in accordance with Claim 14 wherein said optical amplifier configured to utilized said optical amplifier control loop to dynamically adjust the total output power of the optical signal such that the optical signal has an optimum signal to noise ratio at the output of said amplifier system.

16. (new) The system in accordance with Claim 14 wherein said DGEQ further configured to utilize said DGEQ control loop to dynamically adjust a transfer function associated with said DGEQ, thereby controlling the spectral power profile of the optical signal at the output of said system.

17. (new) The system in accordance with Claim 14 wherein said system further comprises a distributed Raman amplifier configured to further adjust the spectral profile of the optical signal by removing spectral tilt and ripple from the optical signal prior to the signal being input to said DGEQ.

18. (new) The system in accordance with Claim 14 wherein said system further configured to decouple said at least one optical amplifier control loop and said DGEQ control loop by layering time-constants of said at least one optical amplifier control loop and said DGEQ control loop.

19. (new) A system for achieving an optimum signal to noise ratio (OSNR) in a optical signal launched into an optical fiber by dynamically compensating for signal loss and dispersion in said optical signal using a layered control strategy, said system comprising:

a first and a second erbium-doped fiber amplifier (EDFA) configured to dynamically adjust a total output power of the optical signal;

a distributed Raman amplifier configured to dynamically adjust the spectral profile of the optical signal, and output the adjusted signal to said first EDFA; and

a dynamic gain equalization filter (DGEQ) interconnected between said first EDFA and said second EDFA, said DGEQ configured to further adjust the spectral profile of the optical signal.

20. (new) The system in accordance with Claim 19 wherein said system further comprises an optical spectral analysis unit (OSA) configured to monitor spectral measurements at a plurality of measurement points in said system, wherein the measurements are utilized in at least one of a first EDFA control loop, a DGEQ control loop, and a second EDFA control loop.

21. (new) The system in accordance with Claim 20 wherein said first EDFA further configured to utilize said first EDFA control loop to maintain a power level of the optical signal at the output of said first EDFA, such that a power level of the optical signal at the output of said DGEQ is maximized and does not exceed a maximum allowable value per channel.

22. (new) The system in accordance with Claim 20 wherein said DGEQ further configured to remove residual spectral tilt and ripple from the optical signal by utilizing said DGEQ control loop to dynamically adjusting a transfer function associated with said DGEQ such that the optical spectrum of the optical signal at the output of said system is flat and has a target optical power profile.

23. (new) A system in accordance with Claim 20 wherein said system further configured to decouple said first EDFA control loop, said DGEQ control loop, and said second EDFA control loop by layering time-constants of said first EDFA control loop, said DGEQ control loop, and said second EDFA control loop.

24. (New) A method of dynamically compensating for signal loss and dispersion in an optical signal traversing though an optical network; comprising:

providing a dynamic gain equalization filter (DGEQ) having a dynamically adjustable transfer function;

providing a first optical amplifier and a second optical amplifier interconnected by the DGEQ to form a dynamic amplifier site in the optical network; and

controlling spectral power profile of the optical signal at an output of the dynamic amplifier site by dynamically adjusting a transfer function associated with the DGEQ, wherein controlling the spectral power profile further includes providing a Raman amplifier connected to an input of the first optical amplifier operable to remove spectral tilt and ripple from the optical signal such that an output of the Raman amplifier is maximized and flattened.